

high molecular weight polyvinyl chloride polymer resin in powder form), Geon 121 made by B. F. Goodrich Chemical Company (a vinyl chloride polymer), or in conjunction with copolymer blending resin Geon 202 of B. F. Goodrich (a copolymer of vinyl chloride and vinylidene chloride), or homopolymer blending resin Exon 666 of Firestone.

A typical plasticizer would be di-isodecyl phthalate made by B. F. Goodrich Chemical Company and others.

The ratio of plasticizer used in this portion of the process is not critical, although the normal range is from 40-90 phr. with a preference for the lower range as long as a workable plastisol is attained. As shown 60 phr. would be preferable. The function of the ratio is as follows:

(1) By the plasticizer being lower in material B it affords a drier (in the sense of plasticizer exudation) surface, but which will partially dissolve the underlying adhesive primer during the fusion operation, and thus form a better bond.

(2)—A lower ratio of plasticizer to resin gives excess capacity of the resin to absorb plasticizer from the succeeding layer of plastisol (material C), which relatively has much less plasticizer capacity.

The inert filler in the formulation acts to harden the plastisol and give additional capacity for plasticizer absorption. The filler may be omitted. A typical filler suitable for this purpose is #10 White marketed by Georgia Marble Company.

The thixotroping agent in material B increases the apparent viscosity at low rates of flow, and has less effect at high rates of flow or agitation. In effect this permits a material to be handled at relatively low viscosity while applying a high build-up or thickness, but tends to hold the material in place by becoming thick once it is motionless. The viscosity must not drop, which would allow the plastisol to sag and drip off in the relatively higher temperatures of about 375° to 400° F., while the mass is fusing. Typical of material in this category would be Santocel Z made by Monsanto Company, St. Louis, Mo.

The epoxidized soya oil acts to give additional water resistance and light stability to the material. Typical of this material is Admex 672 marketed by Archer-Daniels-Midland Co.

The metallic stabilizer selectively reacts with the hydrochloric acid formed during the fusion operation and prevents degradation of the finished product. A typical metallic stabilizer is BC-103 of Advance Chemical Division of Carlisle Chemical Works, New Brunswick, N. J.

#### STEP 5

The metal member is withdrawn from the cold resin suspension after suitable build-up attains. The build-up is attained by virtue of the fact that the heated metal member gels the resin in the suspension material immediately adjacent the surface. Preferably a layer of  $\frac{1}{16}$ " minimum thickness is attained.

The coated metal can be reheated for further curing before the exterior very soft plastisol layer (material C) is poured into the mold about the coated member. However, material B should not be completely heat cured at this for the reasons hereinafter made clear.

Typical formulation for material C is as follows:

	Phr. (parts per 100 parts resin)
High molecular weight dispersion resin	100
Monomeric or polymeric plasticizer mixture (non-migration)	100-300
Inert filler	20
Epoxidized soya oil	5-10
Metallic stabilizer	2-6

The composition of this plastisol is the same as that described above with reference to material B in all respects except for the level of plasticizer. In order to ob-

tain the necessary low Shore A durometer reading, a very high plasticizer level is necessary. The plasticizer or plasticizer combination must be of utmost permanence. The tendency to migrate to migrate to the harder substrate, or have a tacky feeling surface, must be minimized. Typical materials in this classification are Paraplex G-40 (a polyester resinous type plasticizer characterized by permanence, high resistance to extraction, and by their non-volatile and non-migratory properties) of Rohm & Haas Chemical Company, Philadelphia, Pa.

#### STEP 6

The entire mass is then heated to curing temperature. Material C and material B are already partially cured, and as they are completely curing, and as material C is cured therewith, there is a physical blending of the adjoining surfaces to provide an integral bond, as indicated at D in the drawing.

As a modification of the procedure set forth above the adhesive coated metal in Step 3 may, without heating, be coated with a very thick, viscous plastisol (material B with thixotroping agent added) to a thickness of not less than .060". This material may be applied by wiping or troweling on to give the desired thickness without sagging at room temperature, or after application of heat in the fusion process. It must also not be dissolved by, or commingle with the softer plastisol in the outer layer either during the processing of the roll, or later in service.

Such coated member may then be placed in a mold, and the exterior very soft plastisol (material C) is poured into place, and the entire mass is heated to fusing temperature. None of the materials have had heat applied thereto prior to this time, and all are fused simultaneously.

By the use of this modified method lower production time is required because the metal is not heated prior to application of the intermediate layer, and time is not consumed in build-up by dipping. Furthermore, all parts are maintained at the same temperature until curing heat is applied, thereby permitting uniformity in temperature and time for curing and uniformity of the end product.

Thus there is provided a metal core or surface having a soft plastic covering molded thereon. The surface may be ground, smoothed and leveled, and used in rotative pressure engagement with other surfaces without unduly distorting or separating from the core, and does not have any embedded reinforcements to cause irregular distortion.

Having described my invention I claim:

1. A process for coating a metal surface with a soft elastic plastic material comprising, conditioning the surface to provide a clean roughened surface; applying a coating of adhesive suitable for vinyl chloride plastisol covering; heating the coated metal above the gel temperature of plastisol; placing a first layer of plastisol on the surface of the adhesive coating to allow the heated metal to gel a first layer of plastisol of a minimum thickness of about  $\frac{1}{16}$  inch immediately adjacent to the surface of the adhesive while the metal is in such heated state; placing a second layer of plastisol over the surface of the first said layer, the second said layer having a higher proportion of plasticizer therein than the first plastisol layer; and heating the layers and adhesive to a temperature sufficient to completely cure same into an integral covering for the metal surface.

2. The process of claim 1 wherein the first layer of plastisol comprises the following formulation:

	Phr. (parts per 100 parts resin)
High molecular weight dispersion resin	100
Polymeric or monomeric plasticizer	30-90
Inert filler (CaCO <sub>3</sub> )	0-30
Epoxidized soya oil	5-10
Metallic stabilizer	2-5